

FURTHER REMARKS ON PHOSPHORESCENT
BACTERIA.

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In the course of my investigation of phosphorescent bacteria from sea-water, I have been able to obtain three more kinds, in addition to the three of which I gave a preliminary account at the Meeting of this Society, in June last.* As a detailed description of their morphological and biological properties will not be forthcoming for some time yet, I may be permitted to give some few outlines of these new species. Generally speaking they are, as before, easily cultivable on or in a variety of nutritive substances, of which certain marine animals (fishes, etc.), must especially be mentioned, and added to common sea-water they can render it luminous just as the organisms already alluded to (l.c.)

I. (IV).

The first kind—or the fourth, continuing the succession—which I propose to name *Bacillus argenteo-phosphorescens liquefaciens* (rather a long specific name), was secured in a sample of sea-water from Bondi Bay, a few miles south of Sydney, on the 11th September last. By mixing 10 drops of this water with liquefied gelatine in a test-tube, and causing the mixture to solidify along the inner walls of the tube, I noticed, among others, after some time several luminous colonies of the bacillus.

It forms short straight, now and then slightly curved, rods of about .002 mm. in length, and about $\frac{1}{3}$ of it in width (this is according to stained cover-glass preparations taken from agar-agar

* See Proceedings of this Society, Vol. II. Series 2nd. Part 2, 1887, p. 331.

cultures ; in the living state the bacilli present, of course, somewhat larger proportions). The extremities are rounded off. Cultivated in a suspended drop of nutrient meat-broth on hollow-ground slides, the bacilli exhibit an extremely lively mobility ; they grow abundantly to filaments, which are more or less elongated, and variously wound or curved.

They are easily and uniformly stained by means of alkaline methylene-blue.

Their cultures in alkaline nutrient gelatine, a very suitable medium for the cultivation of the micro-organism at ordinary temperatures, cause it to become liquefied. In such a gelatine they yield characteristic colonies, which are different from those of *Bacillus cyaneo-phosphorescens* (l.c. p. 334), and which will be described later on.

The light emitted by their cultures on gelatine, agar-agar, or boiled fish, in the dark, is of a silvery colour, but weak, and insufficient to enable one to read, for instance, the watch. It is the weakest of all the lights given off by the bacteria hitherto obtained.

This microbe is thus altogether different from *Bacillus cyaneo-phosphorescens* (l.c.), * from which it differs also morphologically.

II. (V).

The next kind which may be termed *Bacillus argenteo-phosphorescens* II.† was obtained at the middle of September last, from a piece of a "squid" (*Loligo* sp.; a small species, used as bait, and occasionally sold at fishmongers' in Sydney ; the specimen under notice was derived from such a source). It was also obtained from pieces of the "Sydney Gar-fish" (*Hemirhamphus intermedius*,

*I will here at once mention that alkaline nutrient gelatine is also for this kind an excellent nourishing soil, and that, when I said, it grows rather slowly on or in it, I must have at that time used a gelatine which did not distinctly show an alkaline reaction.

†I shall have to add to the name of the luminous bacterium, viz :—*Bacillus argenteo-phosphorescens* (l.c., p. 333), the number I.

Cant., *H. melanochir*, Cuv. and Val.), purchased at the same time and from the same place. These fragments of squid and gar-fish, after having been moistened with sea-water, and placed in a moist chamber, were found to be phosphorescent all over in the evening of the very day on which they were put aside. Cultures of the luminous mucus at the surface of these objects yielded, among numerous other ones, some colonies of this bacillus; but in a tube of gelatine mixed with some of a salt-infusion of the material from the squid, there appeared one other colony which consisted of the micro-organism next to be mentioned.

Bacillus argenteo-phosphorescens II. shows in cover-glass preparations from gelatine cultures, short, always straight rods, with their ends rounded; length up to about .0027 mm., yet most of the rods in the preparations are shorter; width about .00067 mm. In a drop of nutrient meat-broth they do not exhibit spontaneous movements; besides individual bacilli and diplo-forms, threads made up of few links, and short filaments in which there is no interruption, occur.

They stain well and uniformly with alkaline methylene-blue.

They do not cause liquefaction of the gelatine which serves as nutritive soil to them.

The light given off from pure cultures of this microbe is of a bright silvery colour, and is somewhat more intense than that of *Bacillus argenteo-phosphorescens* (l.c., p. 333); this is especially noticeable in cultures on boiled fish at 21°-24° C., and then also it may be noticed that the colour of the light emitted by the former is greenish-silvery.

On the ground of morphological and physiological characters the organism under consideration is distinguished from that referred to; for instance, it is very easy to demonstrate this difference by means of streak-cultures on gelatine, where in the one case (*B. arg.-phosph.* I.), a flat, waxy yellow ribbon with glassy lustre is produced, whereas in the other (*B. arg.-phosph.* II.), the ribbon has a whitish colour with less prominent lustre, which is rather of a greasy appearance.

III. (VI).

The third (or sixth) kind was derived from a luminous fragment of squid, as already noticed above. As name for it I propose *Bacillus argenteo-phosphorescens* III. Under high powers it exhibits pretty much the same proportions of length and width as that of the former kind. In cultures in nutrient meat-broth the rods are seen to be motile; they form, here and there, short threads.

Alkaline methylene-blue is readily and uniformly taken up by them.

By growing them on or in gelatine, the latter does not become liquefied.

With regard to the light which their cultures emit in the dark, it may be said that it resembles, on the whole, that of the two kinds, named *B. argenteo-phosphorescens* I. and II., more especially the latter. But, in other respects, there are considerable differences between these two and the one in question. Here I need only state that the duration of the phosphorescence of the latter is shorter than that in the case of *B. arg-ph.* II., and still shorter than that of *B. arg-ph.* I. Streak-cultures on gelatine (6 p.c., alkaline) also afford a convenient means of distinction between No. III. and the two others. No. III. grows in the streak far more luxuriantly than do Nos. I. and II. By comparing equally aged but young cultures, say of the second day, with one another, one notices at once, that III. presents a ribbon-like superficial layer, fully double as broad as that of II., and somewhat less than double the width of that of I. The colour and general appearance of the streak-culture of III. is, save insignificant deviations, about the same as that of II.